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## BrO, blizzards, and drivers of polar tropospheric ozone depletion events

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**Abstract.** The source of bromine that drives polar boundary layer ozone depletion events (ODEs) is still open to some debate. While ODEs are generally noted to form under conditions of a shallow stable boundary layer, observations of depleted air under high wind conditions are taken as being transport-related. Here we report observations from Antarctica in which an unusually large cloud of BrO formed over the Weddell Sea. The enhanced BrO was observed over Halley station in coastal Antarctica, providing an opportunity to probe the conditions within an active "bromine explosion" event. On this occasion, enhanced BrO and depleted boundary layer ozone coincided with high wind speeds and saline blowing snow. We derive a simple model to consider the environmental conditions that favour ODEs and find two maxima, one at low wind/stable boundary layer and one at high wind speeds with blowing snow. Modelling calculations aiming to reproduce the wider regional or global impacts of ODEs, either via radiative effects or as a halogen source, will also need to account for high wind speed mechanisms.

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